

# Ethanol Industry Perspective on the “Blend Wall”

*Renewable Fuels Association*



# About the RFA

- The Renewable Fuels Association (RFA) promotes policies, regulations and research and development initiatives that will lead to the increased production and use of fuel ethanol.
- RFA membership includes a broad cross-section of businesses, individuals and organizations dedicated to the expansion of the U.S. fuel ethanol industry.

# Ethanol as a Fuel & Fuel Additive

## 1. E10 (10% ethanol by volume)

- Approved for use in all vehicles and engines
- ~98% of ethanol consumed as E10
- 80% of U.S. gasoline blended with ethanol

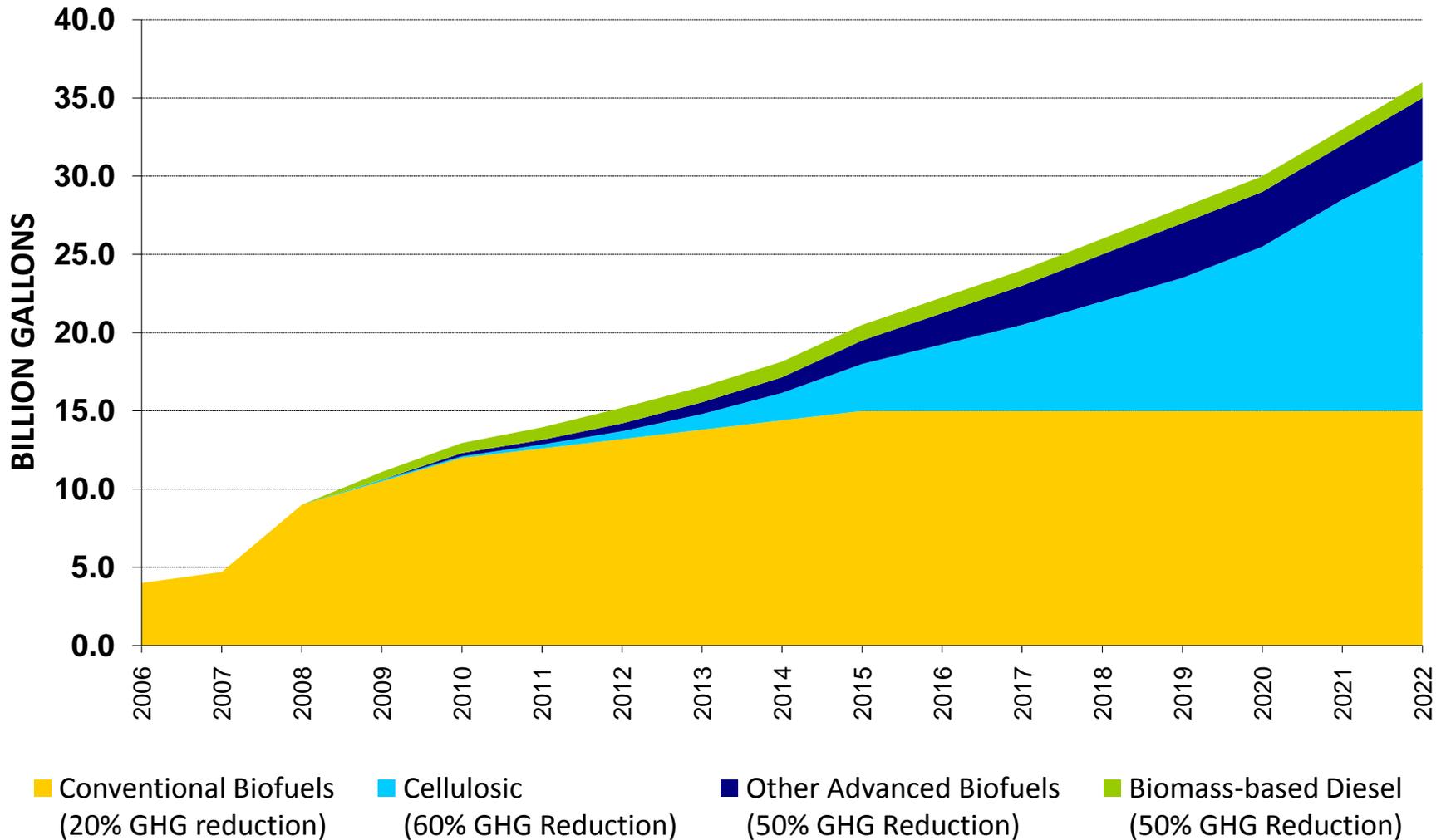
## 2. E85 (70-85% ethanol by volume)

- For use in flex-fuel vehicles (FFVs) only
- 7+ million FFVs; ~2,000 retail outlets
- <2% of ethanol consumed as E85

## 3. Mid-level blends (20, 30, 40% ethanol by volume)

- For use in FFVs only
- Dispensed by “blender pumps” (<250 stations)
- Specifications, BMPs, etc. under development

# Renewable Fuels Standard (RFS)



Note: 20% reduction for conventional biofuels applies only to new construction

# The Bottom Line

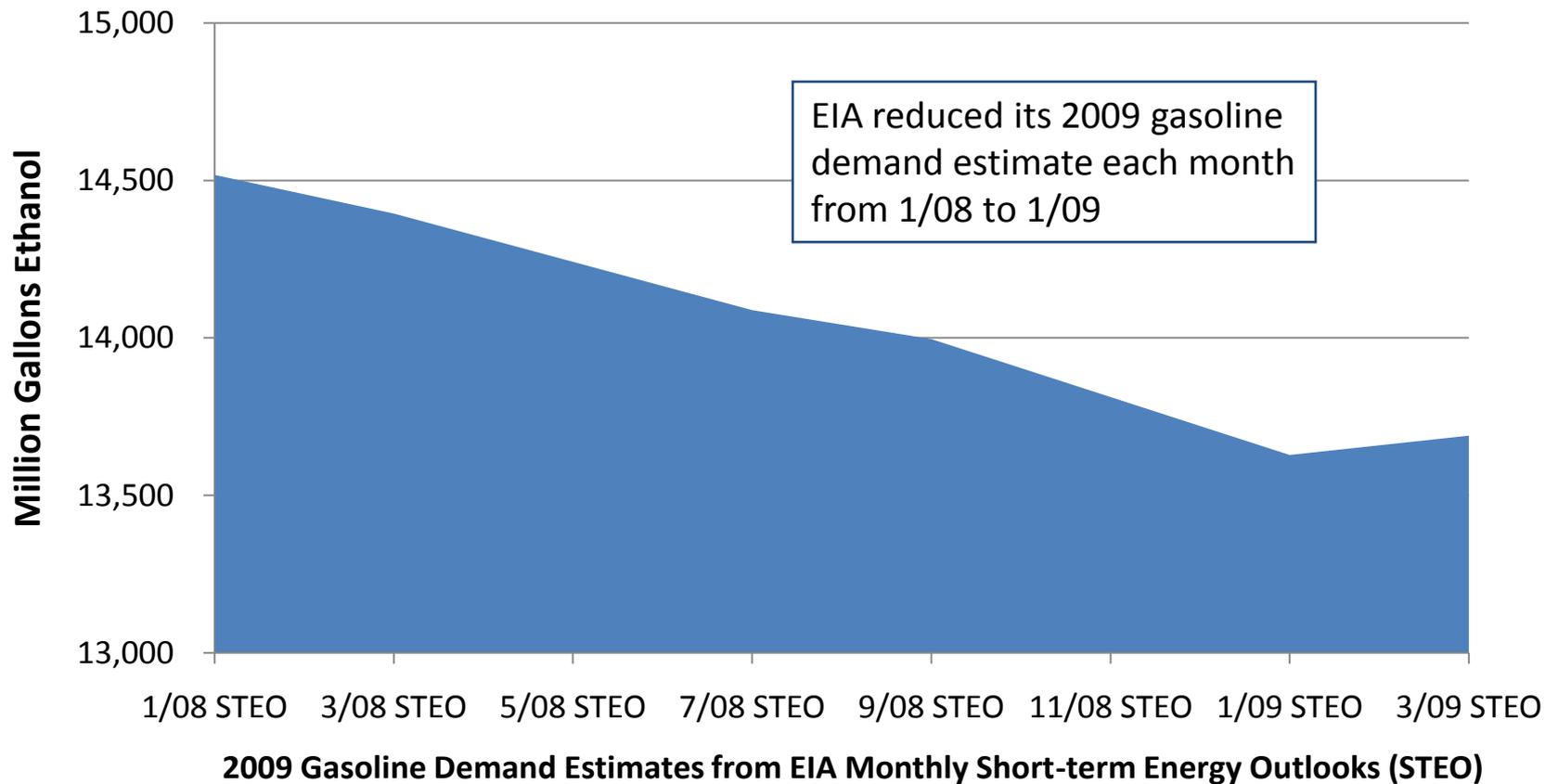
- EISA requires consumption of 36 billion gallons of renewable fuels annually by 2022
- Most of the renewable fuel will be ethanol (~33-34 billion gallons)
- ~34 billion gallons = 27% of 2022 projected gasoline use
- Current law and infrastructure preclude the use of >10% ethanol blends in conventional autos
- ***How will required renewable fuels enter the marketplace once the E10 market is saturated?***

# Meeting RFS Ethanol Targets

- E10 reaches saturation at ~12.5-14 billion gals.
  - 2010 RFS = 10.6 bg (conventional + undifferentiated advanced)
  - 2011 RFS = 12.3 bg (conv. + und. advanced + cellulosic)
  - 2012 RFS = **13.15 bg** (conv. + und. advanced + cellulosic)
  - 2013 RFS = **14.2 bg** (conv. + und. advanced + cellulosic)
- Meeting mid- and long-term RFS targets will require:
  - Rapid proliferation of E85 (FFVs & infrastructure); **and**
  - Approval of blends >E10 for conventional autos

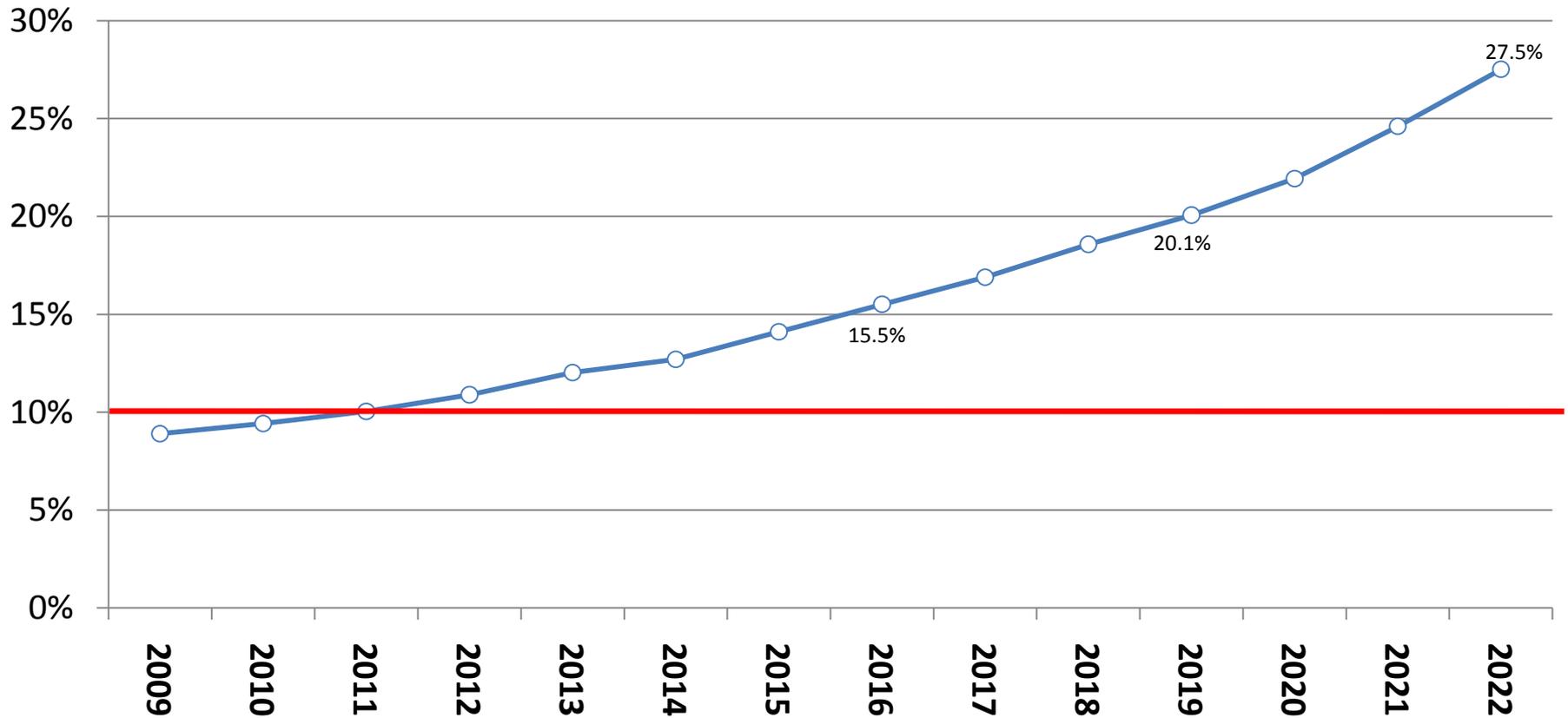
# E10 Saturation is Approaching More Rapidly Because of Falling Gasoline Demand

**E10 Blend Wall Based on 2009 Projected Gasoline Demand**

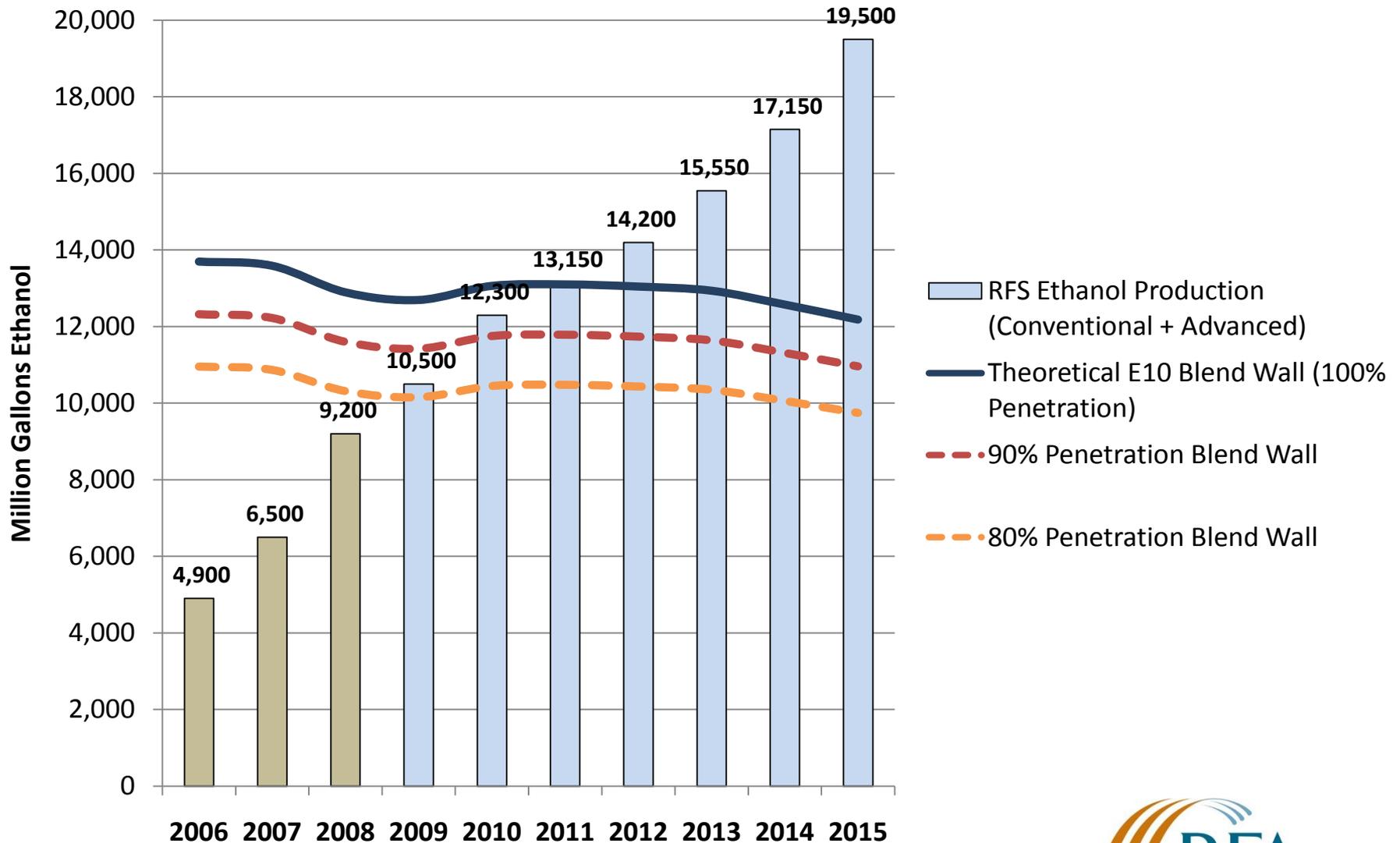


# RFS Ethanol Requirements (% of projected gasoline use)

Ethanol Use Required Under EISA, as Implied % of Total (Blended) Gasoline Consumption  
*NOTE: Does not include effect of small refiners exemption through 2010*



# The E10 Blend Wall



Notes: (1) Assumes undifferentiated biofuel will be ethanol in mid-term;  
 (2) Does not account for small refiner exemption through 2010

# E85 as an Option

- FFVs can use any combination of gasoline and ethanol up to 85% ethanol by volume
- FFVs account for 3% of U.S. light duty fleet
- E85 is offered at 1.5% of U.S. retail stations
- Other challenges:
  - Mileage loss
  - Infrastructure cost
  - Specifications & standards
  - Mismatch between FFV density & E85 availability

# E85 as an Option

- For E85 to absorb RFS-required ethanol in excess of the E10 market:
  - 60,000 retail outlets will be needed (DOE)
  - 90-110 million FFVs will be needed (DOE)
  - Mileage loss must be offset by discount pricing
- Domestic automakers are committed to FFVs
- Federal and state programs help defray costs of E85 infrastructure installation

# Mid-Level Blends as an Option

- 10% ethanol by volume is max level for current conventional auto fleet and fuel supply chain
  - Automobile and small engine warranties
  - Specifications and standards
  - Storage, dispensing infrastructure (?)
- Moving beyond 10% would require:
  - Fuel waiver [CAA Sect. 211 (f)(4)]
  - Change to auto and small engine warranties
  - *Clear* certification of storage, dispensing equipment

# Mid-Level Blends as an Option

## *Fuel Waiver*

- To qualify for a waiver, applicant must show fuel or fuel additive will not *“cause or contribute to a failure of any emission control device or system...”*
- To date, no such failure has occurred in automotive testing for mid-level blends (mostly E15 and E20)
- Applicant data should include: materials compatibility; drive-ability; durability; emissions
- Considerable amount of data available
- Significant work under way (CRC, DOE, trades)

# Sample of completed and ongoing research on mid-level blends

ENTITY	STUDY/REPORT	FUELS TESTED	STATUS
Coordinating Research Council	Fuel Permeation from Automotives	Conv. vehicles tested on E0, E6, and E20; FFVs tested on E85	Project complete; final report on CRC website
Coordinating Research Council	Effect of CO and RVP on Exhaust Emissions of In-Use Fleet	E0, E10 and E20 fuels	Project complete; draft final report
Coordinating Research Council	In-Use Evaporative Emissions	E0, E10, and E20 fuels	Pilot program complete (E0); main program ongoing
Coordinating Research Council	Exhaust and Evaporative Emissions Testing of Flex-Fueled Vehicles	Pilot program: E6, E85, 50/50 mix Main program E9, E32, E66 and E85	Project testing in progress
Coordinating Research Council	Mid Level Ethanol Blend Catalyst Durability Study	E0, E10, E15 and E20 fuels	Project testing in progress
Coordinating Research Council	EPAact Light Duty Vehicle Fuel Effects	E0, E10, E15 and E20 fuels	Project testing by EPA in progress
Coordinating Research Council	Coordinating Research Council, Inc., 2006 Hot-Fuel-Handling Program	E0, E5, E10 and E20 fuels	Project complete; final report on CRC website
Coordinating Research Council	Coordinating Research Council, Inc., 2008 Cold Start and Warm-up Driveability Program	E0, E15, E20, and E85 (fuel-flexed vehicles only)	Project complete; final report on CRC website
Coordinating Research Council	Fuel Chemistry Impacts of Gasoline/Ethanol Blends in HCCI Single Cylinder Test Engine	Ethanol effects tested up to E30	Testing complete; data analysis in progress
Coordinating Research Council	E20 Fuel System and Fuel Component Durability Study	E0, E10, and aggressive E20 fuels	Project testing in progress
National Renewable Energy Laboratory	Issues Associated with the Use of Higher Ethanol Blends (E17-E24)	E17, E24	Completed October 2002
Dept. of Auto Engineering Tech., Minnesota St. U., Mankato	The Effects of E20 on Elastomers Used in Automotive Fuel System Components	E10, E20	Completed February 2008
Dept. of Auto Engineering Tech., Minnesota St. U., Mankato	The Effects of E20 on Plastic Automotive Fuel System Components	E10, E20	Completed February 2008
Dept. of Auto Engineering Tech., Minnesota St. U., Mankato	The Effects of E20 on Automotive Fuel Pumps and Sending Units	E10, E20	Completed February 2008
Dept. of Auto Engineering Tech., Minnesota St. U., Mankato	The Effects of E20 on Metals Used in Automotive Fuel System Components	E10, E20	Completed February 2008
University of Minnesota	Demonstration and Driveability Project to Determine the Feasibility of Using E20 as a Motor Fuel	E0, E20	Completed October 2007
Dept. of Auto Engineering Tech., Minnesota St. U. Mankato	An Examination of Fuel Pumps and Sending Units During a 4000 Hour Endurance Test in E20	E0, E20	Publication Pending
University of Minnesota	E20 Effects in Small Non-Road SI Engines	E0, E20	Completed January 2008
Dept. of Energy	Effects of Intermediate Ethanol Blends on Legacy Vehicles and Small Non-Road Engines, Report 1	E0, E10, E15, E20	Completed October 2008
Energy & Environ. Research Center, U. of North Dakota	Optimal Ethanol Blend Level Investigation	E0, E10, E20, E30, E40	Completed January 2007

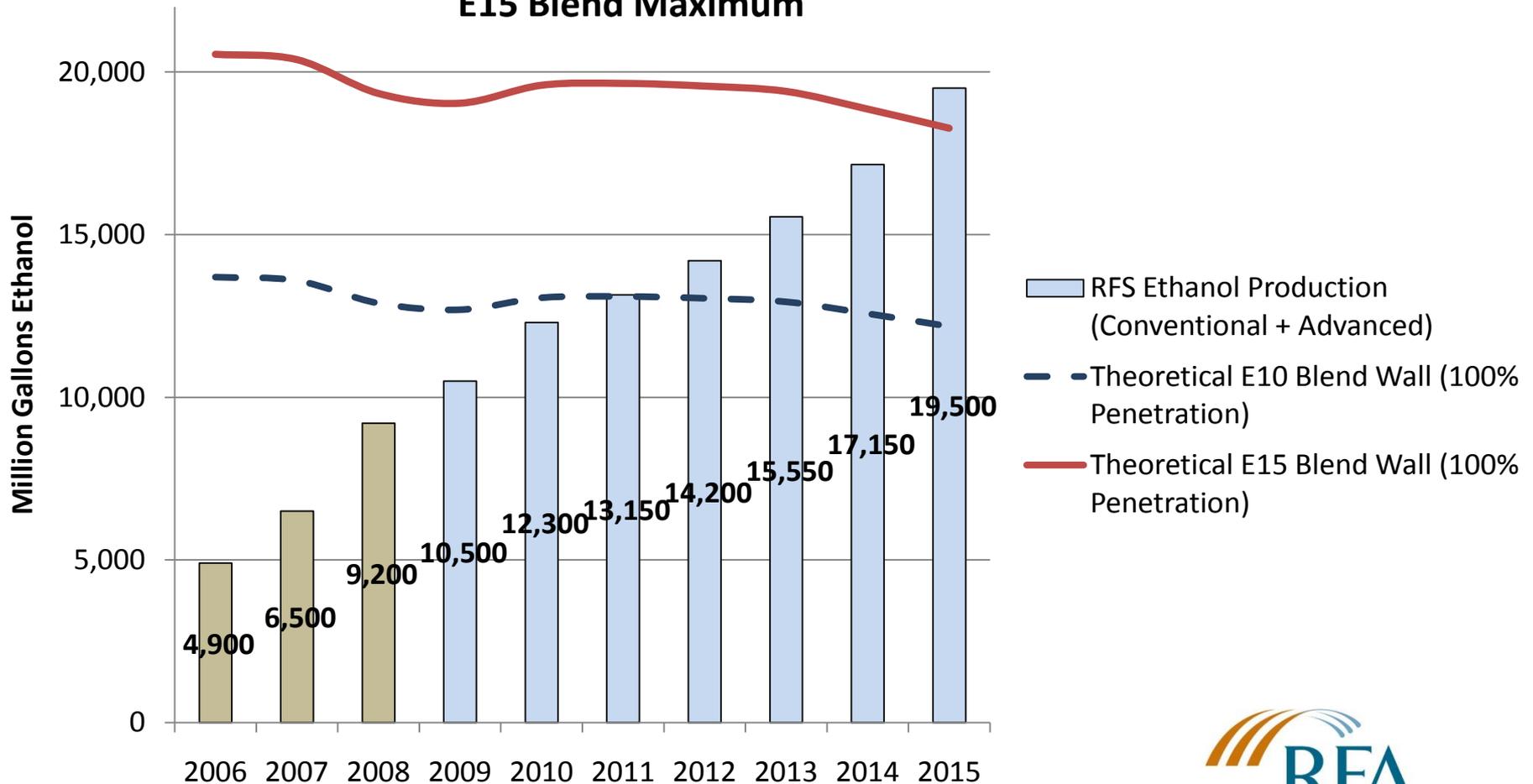


# E15 Fuel Waiver

- Submitted to EPA March 6, 2009
- Applicant was Growth Energy on behalf of certain ethanol cos. (fuel/additive providers)
- Public notice published in April 21 Fed. Reg.
- 30-day comment period closes May 21
- EPA has 270 days from date of submission to take action (Dec. 1, 2009)
- EISA eliminated approval by default

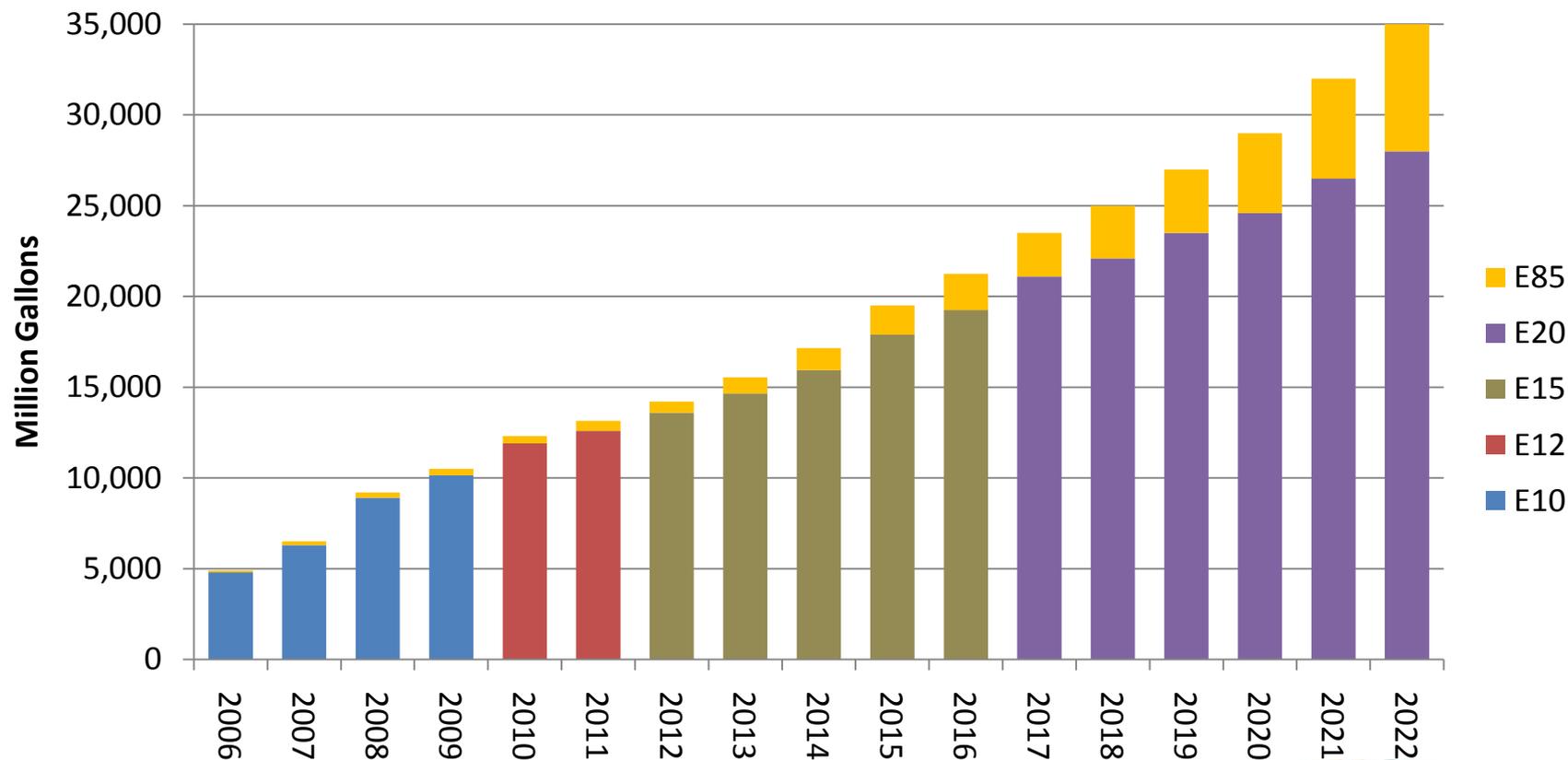
# Impact of E15 Approval on Ethanol Market and RFS Compliance

## E15 Blend Maximum



# Long-term goals likely to require mid-level blends higher than E15

## A Possible RFS Compliance Path for Ethanol? (Illustrative Only)



# Summary

- The E10 “Blend Wall” is rapidly approaching
- E85 is an important long-term strategy, but is unlikely to absorb large quantities of ethanol above E10 market saturation in short term
- Approval of mid-level blends necessary for RFS compliance in near- and mid-term
- Long-term RFS compliance will require combination of mid-level blend approval **and** rapid E85 proliferation
- Considerable automotive research has already been completed with no “show-stoppers”
- Additional research continues
- *We can successfully break through the “Blend Wall” and meet RFS goals*